REMCON ELECTRONICS

Radio Control by the

VERSATILE

all transistor

TRANSMITTER

and

SUPERHET RECEIVER

Reprinted from April 1966
Radio Control Model & Electronics

Full Constructional Details
For Multi or Single Channel

6/-

4a Broadway, Bexleyheath, Kent

Designed and Developed by us . . .

Hand-built by you . . .

Remcon rely on you, the constructor, to produce for us both a finished result of which we are proud.
Remcon do this by care in design and offering only components which individually have the exact specifications as laid down by the designer. All we ask of you is to ensure that your workmanship, particularly soldering, is beyond reproach.

Versatile Tx.

all transistor 12 volt operation printed circuit construction—single channel up to 12 channels—bi-simultaneous operation—stable—easily aligned—compact.

Versatile Rx.

superhet all transistor 6 volt operation using servo battery single channel or reeds up to 12 channel—easy printed circuit construction—simple to line up.

REMCON VERSATILE TRANSMITTER

Designed by . . . . . ERIC HOOK

Developed by . . . . GEOFF. CHAPMAN

THIS is the second generation of the now well-known Remcon Twelve, the only modification being to the crystal oscillator and P.A. coil.

For those not so familiar with this piece of equipment, the Remcon Twelve can be made in any number of channels from 1 to 12, and by use of a carefully laid out printed circuit, makes building well within the capabilities of any one who can handle a soldering iron properly, without having had previous experience of radio equipment construction.

The modification to the crystal oscillator coil simply is to remove any alternative tapping and with it any chance of confusion.

The change to the P.A. coil, however, is quite important in that side band interference is now nil, and there is a marked increase in R.F. output without over taxing the power output of the P.P.1 dry batteries used.

Thus constructors who have already built Remcon Twelves to the first generation design, will quickly see that they are able to modify the existing p.c. board in the area of L.2 and new P.A. coils will be on sale from Remcon Electronics to replace the existing one, for those who do not wish to wind their own. There is no point in fitting a new oscillator coil to existing transmitters.

General Description

Case size 7¾ in. × 6·5/8 in. × 2·3/8 in.

Weight including batteries 2¾ lbs.

Two P.P.1 batteries in series provide 12v. drive to the transmitter and with the Tx current consumption give long life.

The switches are positioned on the board so that the left ones operate engine, elevator and trim and those on the right operate rudder, aileron and auxiliary. A number of modellers have used this auxiliary 6th switch on the right hand of the case to operate engine control as well as the normal position, so that engine control may be worked simultaneously with elevator and elevator trim, giving a smooth proportional like landing approach. A custom made centre loaded aerial is available and in conjunction with the Versatile Remcon Superhet Receiver ranges of over 1,000 yards have been quoted by independent builders.

The Tx. is well balanced with battery installed and aerial extended and sits well on the cummerbund—the hallmark of the successful radio flyer !

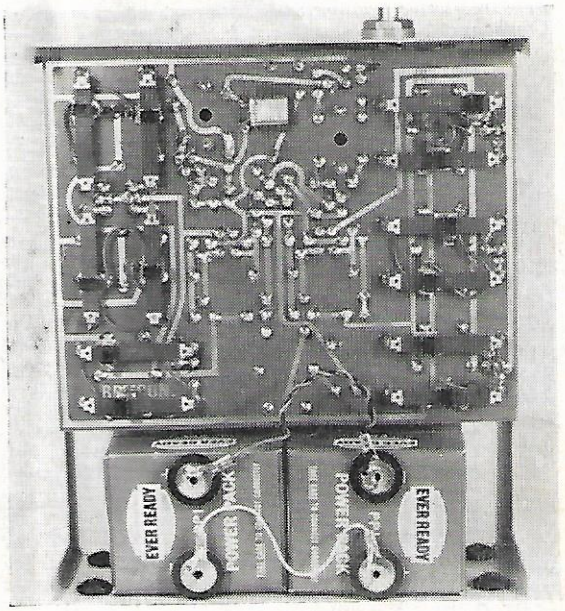
Construction Information

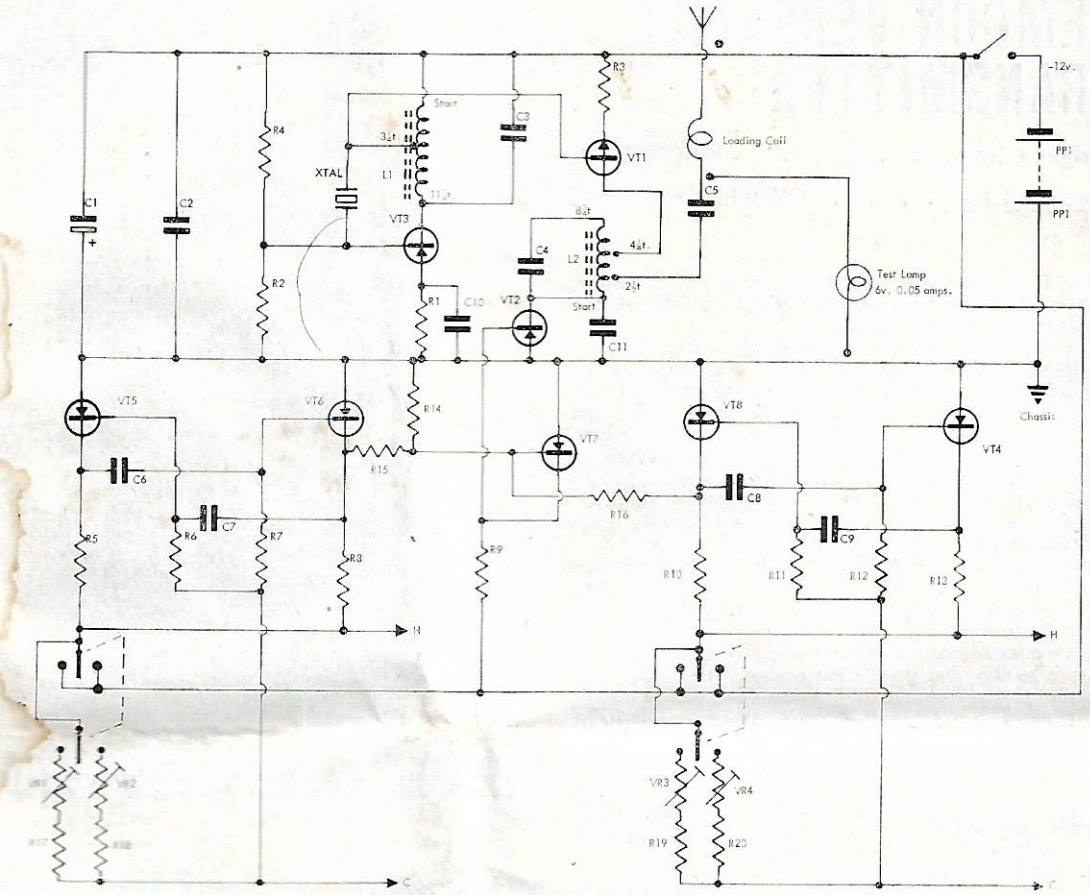
Your attention is drawn to the following points (those purchasing components from Remcon will find some of these operations have been carried out).

1. Coil winding: L.1 crystal oscillator coil—total 11¾ turns of 24 swg. enam. wire tapped at 3¼ turns. L.2 P.A. coil—total 8¾ turns 18 swg. enam. wire tapped at 2½ and 4¼ turns.
   All coil windings should be clockwise viewed from the under side of the former.
2. The switches are fitted by soldering 6 lengths of 18 swg. copper wire through the p.c. board leaving approximately 1/8 in. on the plain side to take

Remcon provide this clean looking case, dimpled for the keying switches to make "thumb twitching" more comfortable. The article gives dimensions for those who wish to do their own tin bashing.

Below: Back of the case removed showing all the tone adjustments slider pots and the comparatively simple land pattern. There should be sufficient space below the board to accommodate two 6 volt Dryfit accumulators in place of PP1s.





Tx. Theoretical Circuit

Remcon Twelve transmitter
Component Values

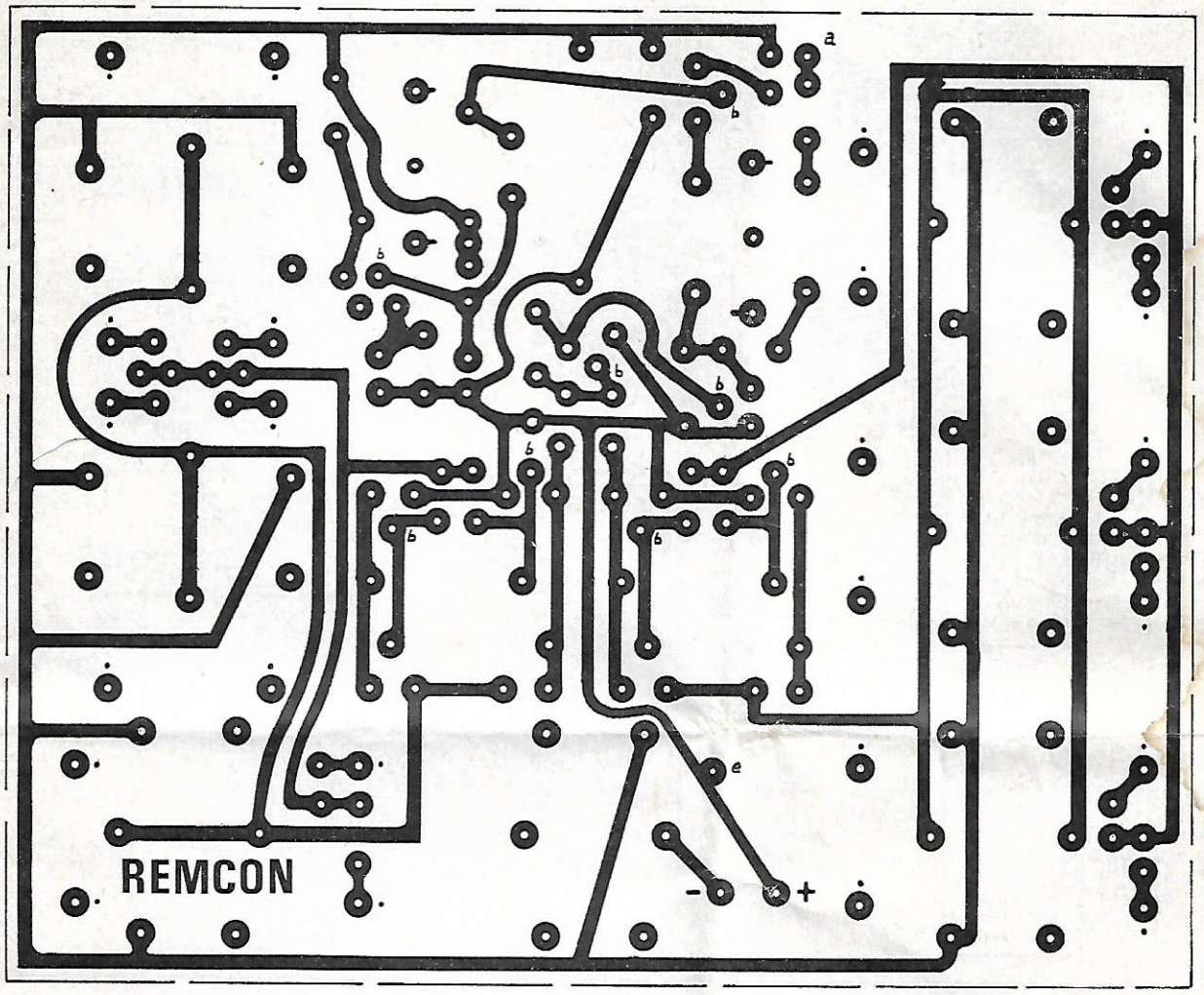
R1	220 ohms	C1	250uF 15v. wkg. electrolytic
R2	1·2K	C2	·01uF
R3	15 ohms	C3	33pF
R4	15K	C4	50pF
R5	2·2K	C5	·005uF
R6	12K ± 2% NJ 60	C6	·1uF ± 5%
R7	8·2K ± 2% NJ 60	C7	·1uF ± 5%
R8	2·2K	C8	·1uF ± 5%
R9	10K	C9	·1uF ± 5%
R10	2·2K	C10	·001uF
R11	8·2K ± 2% NJ 60	C11	·001uF
R12	18K ± 2% NJ 60	VT1	2N697
R13	2·2K	VT2	NKT218
R14	1K	VT3	OC170
R15	22K	VT4	2G302
R16	22K	VT5	2G302
R17	Select on test	VT6	2G302
R18	desired reed fre-	VT7	2G302
R19	quency (high stab)	VT8	2G302
		Xtal	27 m/cs. 3rd overtone
R20	1K Slider Wire Wound		
VR1	One per		
VR2	channel		
VR3			
VR4			

For tone tuning a typical selection would be:

2 — 560 ohms.
2 — 1K
2 — 1·5K
1 — 1·8K
1 — 2·2K
1 — 2·7K
1 — 3·3K
1 — 3·9K
1 — 4·7K
All types NJ60 ± 2%

the switch, the switch is then located within the pins and after checking that it aligns correctly the 6 pins are all soldered to the switch. The switches must sit evenly on the board otherwise distortion may take place. At the same time as fitting the on/off switch in the centre of the board, the earth lead may be taken to this switch's throat for connection later.

3. Building continues after adding switches and tuning coils in almost any order convenient to the builder; transistors must be correctly triangulated; the tone tuning resistors cannot be added until a later stage.
   An important feature is soldering and should be carried out with a 25w. iron with a clean bit which is really hot. The iron should be brought into contact with the copper land, the solder



Full Size Tx. P.C. Board

applied to the junction of the iron and the land and when molten, the solder slid over to the component wire, when a clean wet joint should be made. Do not use heat shunts since the majority of components will withstand a solder bit at working temperature $\frac{1}{4}$ in. away for periods of up to 10 seconds. Resistors should be placed firmly on the board body end, whereas transistors should be gently pushed through the board so that they stand approximately $\frac{1}{4}$ in. off.

4. The tuning sliders require a little care in fitting and should be soldered with the wire track facing the copper laminate sufficiently high from the board to allow the slider to clear the solder blobs. Short lengths of p.v.c. covered wire are added to the tags on the slider and are taken to the switch lands opposite, so that when the switch is pressed it moves towards the slider to be adjusted and makes for easier tone alignment.

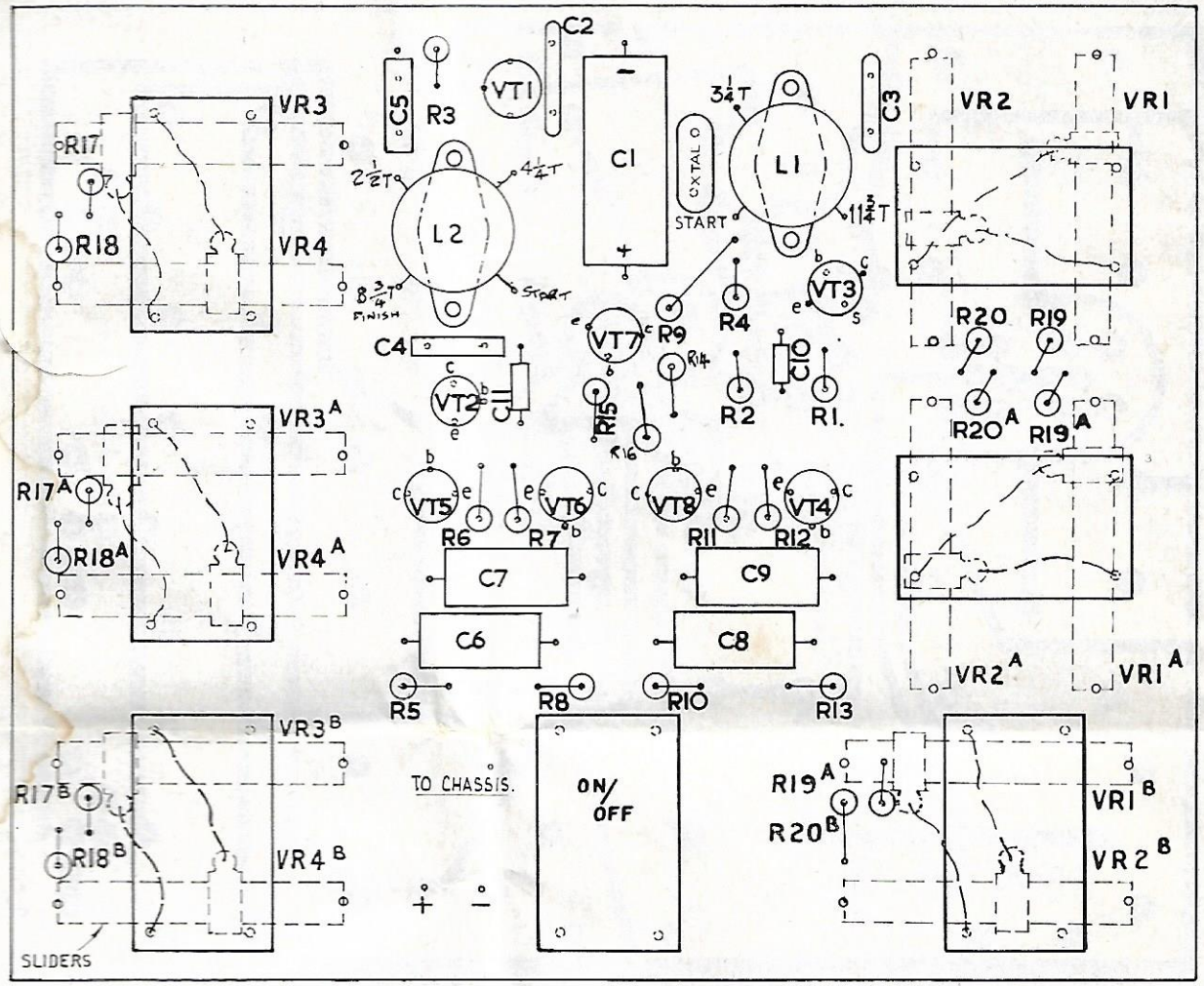
Tuning

Check the board for possible short circuits and dry joints and correct component placing. 12-v. is applied at the appropriate place, and R.F. tuning commences as follows:

Connect 0–100 mA meter in the positive lead of the battery connect a 6v. ·06 amp. lamp as shown in the theoretical circuit, the cores should be previously positioned approximately in the middle of the windings. L.1 is tuned by screwing the core away from the p.c. board until maximum current is recorded, i.e. 30–40 mA. Now tune the P.A. by tuning to maximum brilliance of the bulb. The tuning procedure can be confirmed by using a simple field strength meter if available.

Tone alignment

Assuming that one has an operative multi channel receiver available to which the transmitter is to be aligned, then it will be found that by putting a shorting strap in one of the positions on the left hand side (viewed from front) should bring in the shortest reed. In actual fact the slider resistor should cover one reed, possibly, just allowing the second reed to speak. By adding fixed electrosil NJ.60 resistors in approximately 500 ohm steps, it will be found that the next longest reed will be tuned with each increment.



TYPICAL SLIDER ARRGT

Alternatively a linear 5K pot may be used in place of the fixed resistor. The slider is set to approximately mid-position and the pot turned carefully until the desired reed speaks soundly. The value of the pot reading is then either measured or calculated from its proportion of total rotation and a fixed resistor to the nearest preferred value inserted.

Set out below is a table of approximate values which are used in conjunction with a well-known imported reed bank:

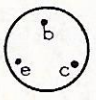
Left hand switches viewed from front	Shortest reed	—No fixed resistance
	Reed 3	—560 ohms added resistance
	Reed 3	—1K ohms ,,
	Reed 4	—1·5K ohms ,,
	Reed 5	—1·8K ohms ,,
	Reed 6	—2·2K ohms ,,
Right hand switches	Reed 7	—560 ohms ,,
	Reed 8	—1K ohms ,,
	Reed 9	—1·5K ohms ,,
Aileron Rudder etc.	Reed 10	—2·7K ohms ,,
	Reed 11	—3·3K ohms ,,
	Reed 12	—3·9K ohms ,,

Final Assembly

Having aligned the transmitter as stated above, it is now fitted into the case, the aerial is fitted first making sure that it is completely insulated from the case, and is attached to the Tx. board via a short pigtail. A good earth is required between the case and battery positive which is made by the connection around the throat of the on/off switch, and sometimes the case needs cleaning to ensure good electrical contact between the clamp nuts of the on/off switch. On final assembly into the case, it may be necessary to finally tune using either a 100 mA meter as described earlier, a field strength meter, or better still a physical range check.

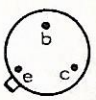
TRANSISTOR KEY

OC170



NKT 218

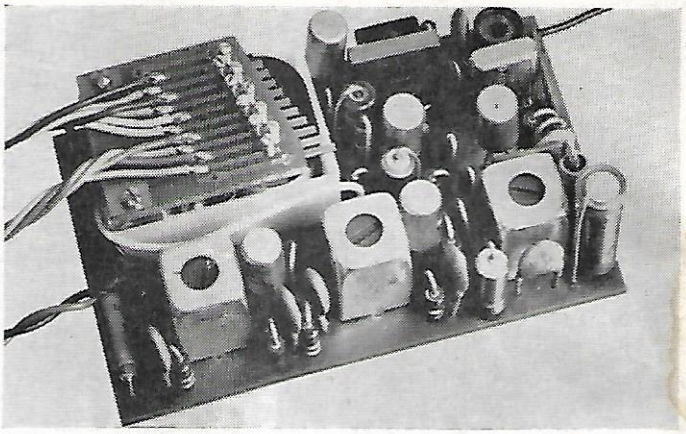
2G303 or 302



2N 697

Red spot nearest collector on NKT 218 VIEW ON PINS

Remcon Versatile Superhet Receiver



Designed by . . . . . ERIC HOOK

Developed by . . GEOFF. CHAPMAN

WHILST this Receiver is offered in conjunction with the Remcon Twelve all transistor transmitter, it is understood that it can be used with any crystal controlled transmitter, providing a matched pair of crystals are used, and they have the necessary 465 kc. I.F. spacing.

This receiver represents the second generation of the earlier design and has been arranged so that all adjustments, select on test components, etc., are eliminated, with the exception of the normal tuning procedures.

To emphasize this, 6 receivers to this new design were built with standard components supplied by Remcon for the Boat Show of 1966. All receivers functioned to virtually identical standard of performance, and were in no way specially treated.

Although the receiver is primarily offered for operation of multi-channel reedbanks, it has by popular demand been designed so that it may be modified by the user at any time to operate either an escapement such as the Elmic Compact, or alternatively, a relay of approximately 50 ohms to 150 ohms resistance. The single channel versions may be operated by any transmitter providing a tone in the 400–800 cycles per second range.

The construction of a superhet receiver may seem a formidable task, particularly in view of the fact that many people are under the erroneous impression that elaborate lining up is required. In particular this apparently applies to the intermediate transformer commonly called the I.F. transformers, and it should be noted that these are supplied by Remcon factory set to such close tolerances that it is rarely necessary to re-adjust them by more than plus or minus ¼ of a turn.

It is pertinent at this point to make a few comments on the reedbanks. Of the many types available, the following have been found specially suitable when used in conjunction with this receiver. These are all of 40 ohm coil resistance and have been used very successfully for all the possible applications for the receiver. The types are—Deans 10- and 12-channel reed units, Medco 10- and 12-channel and Min-X 6–12-channel reed units.

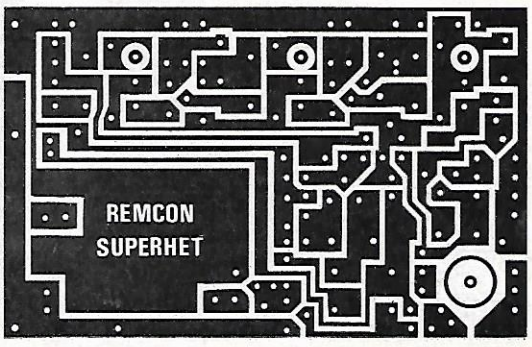
For those interested, here are a few technical details. The frequency response is such that the 3 d.b. points occur plus or minus 2 kcs. either side of the I.F. coil centre frequency. The adjacent channel rejection that is for transmitter 50 kcs. away from your own transmitter frequency is 53 decibels, this means to say that if you were standing alongside another transmitter controlling your model and the other transmitter was 50 kcs. away from your frequency, then it would have to be some 20,000 times more powerful than your transmitter to have any effect on your model as long as your receiver is operating within its automatic volume control range. The approximate sensitivity of the receiver is 10 micro volts r.m.s. modulated 80 to 100% to provide satisfactory reed drive.

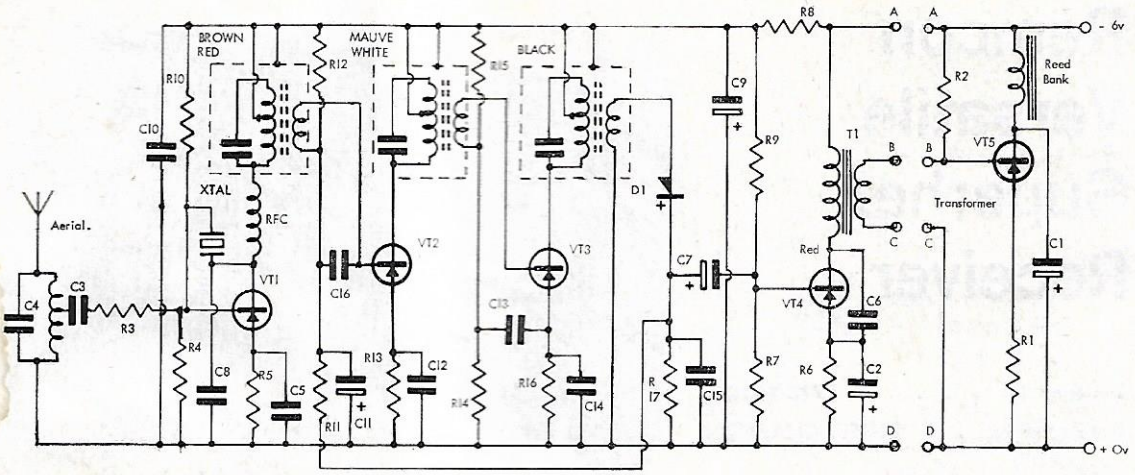
Brief Technical Description of the Circuit

We will commence at the frequency changer because this is a little unusual by normal standards, that is to say at transistor VT.1, we have a circuit which with the exception of the crystal, the R.F.C. and its tuning condenser and the 220 ohm resistor is a perfectly standard *mixer* circuit. Normally in this sort of condition, that is to say that *without* these components, it is necessary to feed in from a separate single transistor local oscillator a signal differing from the transmitter frequency by the intermediate frequency of the Rx. By the ingenious design incorporated in this receiver, it has been possible to eliminate a considerable number of parts including one transistor, and make this mixer into a combined oscillator and mixer, in fact it performs very well in this mode.

Following this are two perfectly conventional intermediate amplifier stages with diode detector providing normal A.V.C. action on the first I.F. stage V.T.2. The output of the diode detector is filtered and passed to the audio frequency amplifier V.T.4 and the collector circuit which contains a small transformer with its primary tuned approximately to the centre of reed frequency band; 500–600 c.p.s. This provides a wave form re-

Full Size P.C. Board





Rx. Theoretical Circuit

Multi Output Stage ▲

Component Values

All Versions

R1 : 10 ohm	C3 : ·01uF
R2 : 4·7K	C4 : 20pF
R3 : 220 ohm	C5 : ·01uF
R4 : 2·2K	C6 : ·01uF
R5 : 1K	C7 : 10uF
R6 : 470 ohm	C8 : 33pF
R7 : 4·7K	C9 : 40/80uF
R8 : 220 ohm	C10 : ·03uF
R9 : 47K	C11 : 10uF
R10 : 18K	C12 : ·1uF
R11 : 4·7K	C13 : ·1uF
R12 : 33K	C14 : ·1uF
R13 : 390 ohm	C15 : ·01uF
R14 : 4·7K	C16 : 470pF
R15 : 22K	VT1 : NKT676
R16 : 1K	VT2 : NKT676
R17 : 4·7K	VT3 : NKT676
C1 : 2uf	VT4 : NKT212
C2 : 32/40uf	VT5 : NKT218
T1 : Transformer 5 : 1	D1 : OA47 or similar

Reed Bank 40 ohm.

Aerial coil: 5½ turns 28 s.w.g. c.c.w. plus 6½ turns on ¼ in. dia. slugged former.

I.F. cans: Supplied by Brayhead's pre-adjusted for Remcon.

Aerial: 30–36 in.

shaping at the Rx. and the signal from this section is then passed to the Class 'B' reed-bank driver stage. This stage runs on a very small current of 3 to 5 m.A which gives it sufficient bias to be in a sensitive state when driven by V.T.4.

Soldering

When you come to build this superhet Rx. it should be realised it is important to be able to solder carefully. The p.c. is necessarily crowded, but has been laid out carefully to make for easy soldering, even so, good soldering can only be achieved with a hot clean iron, by hot is meant an iron which can be used to make a clean joint very quickly. A joint should be made with a clean iron and core solder as provided, with the core solder between the board and the iron. It is best to start the joint on the copper and lead the molten solder to the wire. Please do not ignore these points regarding soldering, since it is no exception to say that 90% of trouble due to mal-functioning of circuits is caused by poor soldering.

Building Instructions

In the Remcon kit some of these operations are already carried out.

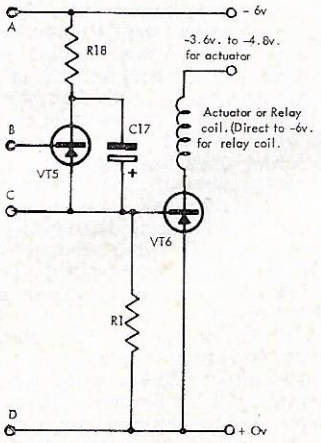
Building should start with the coil, the former should be cemented into the board with an adhesive such as Bostik No. 1, the coil is tapped and wound in two parts. It starts at A and 5½ turns of 28 s.w.g. enam. wire are wound on clockwise (view from the top) and finish at B. A further 6½ turns of the same wire are wound on to start at C and finish at D. Winding is easy if the start of each winding is soldered to the appropriate land first.

We now come to fitting the intermediate frequency transformers which are colour coded. Assuming the first to be fitted is brown red, this should be treated carefully when soldering, because the wires are short and because the small internal condenser may be overheated, therefore the soldering is done quickly. The supporting lugs on the can should be soldered to the p.c. but the spare pin need not be soldered.

The R.F.C. may now be soldered in and the sequence continues. Note the component wires must not touch the I.F. cans, if they are close then use sleeving, e.g. R12.

Next the transformer which has four wires and should

Single Channel Output Stage



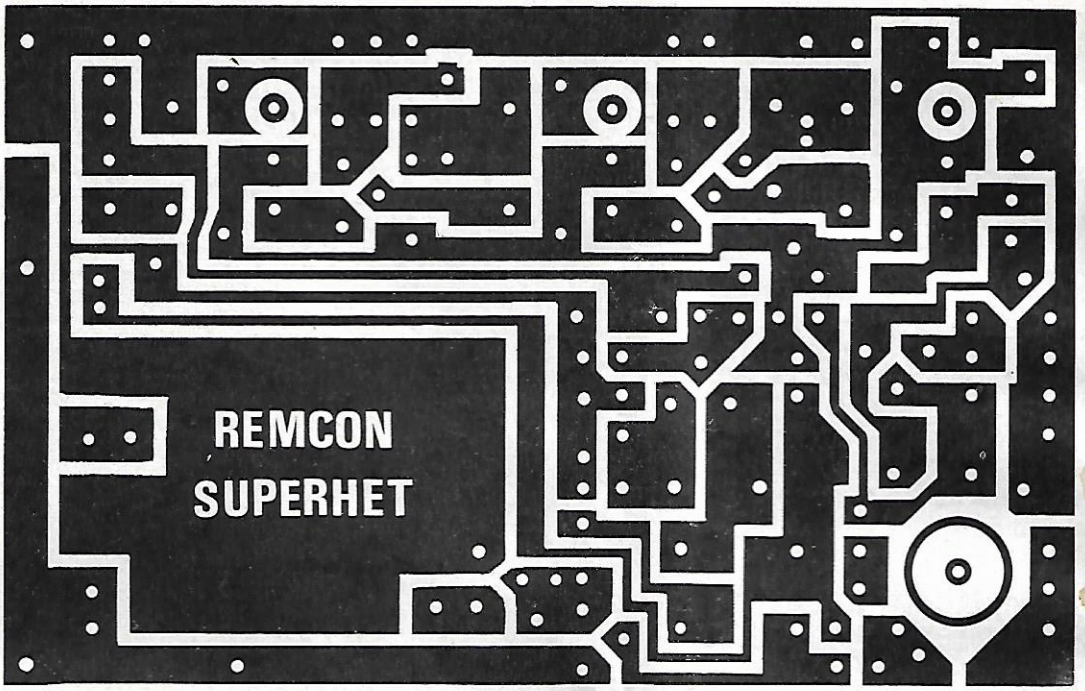
Single Channel version only

VT6:
NKT228

C17:
50uF/6·4v.

R1:
now 220 ohm 1/10w.

R18:
100 ohm ½w.



Twice Size Rx. P.C. Board

be pushed right through the board carefully noting the red pin position, the pins are now soldered and trimmed.

V.T.5 (NKT.218) fits snugly between the transformer and the reed bank and should be pushed down to within 3/16 in. of the board insulation and stand-offs are unnecessary. This applies to all transistors. The diagram gives the emitter, base, collector arrangements for NKT. transistors, viewed from the pins. The building sequence continues in logical order, noting carefully the following:

a. The Rx. crystal (the lower frequency one of a matched pair) may be soldered in position, but should stand about $\frac{1}{8}$ inch away from the board.

b. R.13 (390 ohms) note position of body of R.13 to assist in lining up at a later stage. Note that all components should be gently pushed into the holes so that wire lengths are a minimum.

c. The plain wire connector between holes 3 and 4 for reed use only, for single channel use, see separate paragraph.

Red and black flexible leads are soldered into the position shown and for positive switched amplifiers the reed comb may be connected to the hole for the reed comb marked positive. For negative switched amplifiers this hole may be opened up to serve as a lead through for an insulated wire to be passed through and soldered to the adjacent negative land. A flexible wire 2 ft. 6 in. to 3 ft. long should be added for the aerial before any current is connected. It is vital to check that there are no short circuits between lands and that no joints appear to be ' dry '.

d. The condenser C.1 is the reed bank tuning condenser and may be fitted now or when the reed bank is fitted, whichever makes a more tidy job. It is possible that the 2 μF value stated is not correct for a particular reed bank, but this value is typical for 40 ohms reed units, and is found suitable for tuning the reed bank to its middle reed frequency. This capacitor is an electrolytic and therefore its polarity must be observed.

Lining up Sequence

Unscrew the slug in the Aladdin former so that it is just out of the windings.

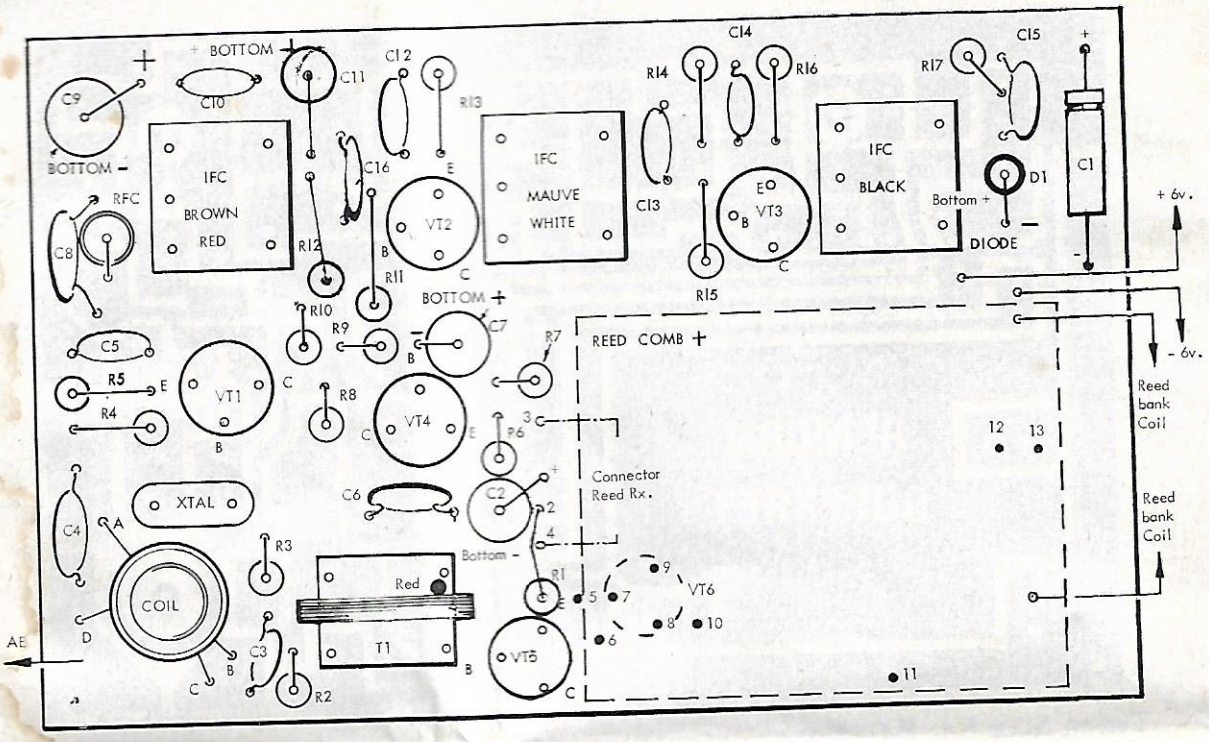
Do not touch the I.F. transformers. Connect in a 6-v. source either DEAC or dry batteries and using a test meter with a sensitivity of at least 1,000 ohms per volt (RipMax test meter at 49/6 is quite suitable), measure approx. voltage between battery *positive* and the following points without any carrier from the Tx.

VT1	emitter	·3v (10v range)
VT2	,,	·45v (10v range)
VT3	,,	·7v (10v range)
VT4	,,	·32v (10v range)
VT5	,,	·03v (1v range)

Now switch on carrier wave of transmitter with correct crystal inserted and with approximately 12 in. of aerial out of the Tx. case. Connect meter to battery positive and VT2 emitter, that is wire end of R.13, this is to measure the A.V.C. voltage. The Tx. is moved close enough to the Rx. to cause the voltage to fall from an initial value of approximately ·45v. to about ·3v. adjust in turn the cores of the I.F. transformers—black, mauve/white, brown/red, respectively to obtain a minimum reading on the meter.

NOTE: The adjustment on the cores of the I.F.T's. will normally be a quarter of a turn either way at the most. In any case, do not turn the cores more than one turn in either direction otherwise the initial factory tuning will be lost.

To obtain maximum sensitivity from the Rx. the transmitter is taken some distance away and the adjustments checked. Slowly screw the slug in the aladdin R.F. coil for minimum voltage at this A.V.C. point (R.13) it may be necessary to move the Tx. a considerable distance away from the Rx. to maintain minimum output at ·3v. The final part of the test is of course, to key a tone on the transmitter which should drive a reed on the reed bank providing the tone frequency



Twice size Rx. Component Placement

corresponds with one of the reed frequencies, but first a word or two on reed banks.

Reed banks from certain manufacturers are not always set for use when they leave their works. When using a new reed bank, the builder should carefully examine the reed gaps and carefully set them if necessary. The gap between the contact and the longest reed should be about ·035 in. whilst the gap above the shortest reed should be about ·02 in. with the others falling in between these dimensions.

Considering a previously tone aligned 12-channel Tx. for a moment, it is most unusual if one at least of the channels does not line up with a reed frequency right away.

To convert to Single Channel Version

Either Relay (50–150 *ohm*) *or Actuator Elmic Compact, Commander or similar to suit.*

Connector between holes 3 and 4 omitted
insert instead between holes 4 and 5 and
Resistor 4·7K R.2 omitted.

R.1 — 10 ohm for reed use 220 ohm 1/10 watt instead for single channel in holes 1 and 2.

VT6 NKT228 base to hole 7, collector to hole 8 Emitter (nearest tag on VT6 can) to hole 9.

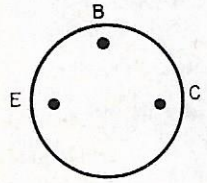
C17 — 50 uf. 6v. positive to hole 6 negative to hole 11 For pulsed relay use 10 uf, instead.

Replace reed bank coil with 100 ohm ½ watt Resistor.

Actuator or Relay coil — Connect between holes 10 and 12; hole 13 goes to 3·6v. or 4·8v. Tap on Rx. Deac. for actuators and to 6v. for relay operation.

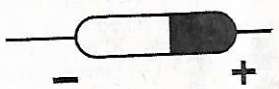
Lining up is carried out exactly as described above.

Component Key

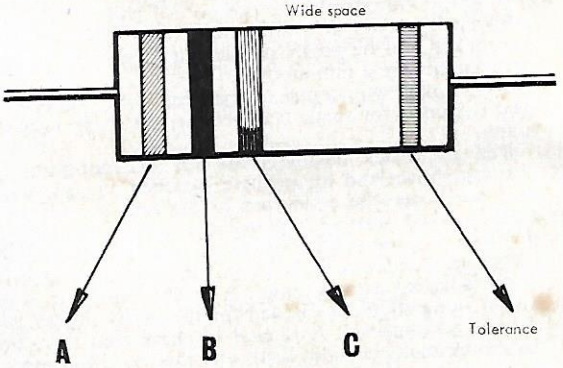


N.K.T. TRANSISTORS
VIEW FROM UNDERSIDE

Red or grey band denotes +ve end



OA 47 DIODE



0. Black
1. Brown
2. Red
3. Orange
4. Yellow
5. Green
6. Blue
7. Mauve
8. Grey
9. White

Tolerance
± 10% Silver
± 2% Red
(a) First Number
(b) Second Number
(c) Multipliers No. of 0's
e.g. 18K = 18000 = Brown, Grey, Orange.
10Ω = Brown, Black, Black.

A selection of unsolicited testimonials

"I have built a Remcon superhet from the kit and I am very satisfied with the result. My set working (reed vibrating) without any initial tuning whatsoever." *J.J.B. Sutton in Ashfield.*

"I am pleased with your transmitter and receiver which feel to have been made just for me." *P.B. Yugoslavia.*

"I wish to convey my appreciation and pleasure in finding a transmitter that I can build which can eventually lead to 'full-house' multi . . . I have almost finished building a 36 in. cabin cruiser and your transmitter will be used in conjunction with it." *P.McN. Glasgow.*

"To let you know received the Remcon kits safely and have successfully assembled this Tx. and Rx. and 5 amplifiers, and all functioning perfectly. I have no regrets and more than pleased with the results." *W.M. N.S.W. Aust.*

"I have been most grateful to you for the way in which you have fulfilled my orders. This has allowed us to get a lot of the boat constructed. Your efficiency is also commendable." *Dr. A.M. Argyle.*

"My Tx. arrived on Saturday and is now working satisfactory. Two of our Club members are already using Remcon Tx's and the results are excellent." *J.B. Sheffield.*

By choosing REMCON you are in good company. Our R/C circuits have been built by many well known bodies for all remote control applications.

Including:

- **Shell-Mex and B.P.**
- **British European Airways**
- **Ferranti**
- **Associated Portland Cement**
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- **Office of the High Commissioner of Australia**

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by REMCON ELECTRONICS
FOR THE REMCON VERSATILE TRANSMITTER AND THE REMCON SUPERHET RECEIVER

REMCON TWELVE TRANSMITTER
For Single and Multi Channel Applications

An all transistor crystal controlled transmitter for single or bi-simultaneous tone transmission of up to twelve channels for use with superhet or superegen receivers.
Range and tone stability are excellent and achieved only by optimised design of circuitry and use of carefully matched components of the latest type.

THE TX YOU CAN BUILD FOR £18.7.0
(Crystals extra)

REMCON TWELVE PRICES:

SEMICONDUCTORS—seven PNP transistors one NPN power transistor	78/-
COMPONENTS—resistors and condensers, including essential Histab and close tolerance items	63/-
HARDWARE—printed circuit board with ready wound coils, nuts, bolts, battery clips, solder and wire	39/6
ANODISED, ALUMINIUM, DECORATED CASE	39/6
CHROME TELESCOPIC AERIAL CENTRE LOADED	37/6
SUPER LIGHT ACTION SWITCHES: On/off ea. ... 10/0 Biased ea. ...	11/6
WIRE WOUND SLIDERS (one per chan.) ea.	2/6
CRYSTALS: NOMINAL 27 mc/s ... ea.	26/0

Note: Nominal crystals cannot be matched for s/het operation.

MINIATURE TOGGLE SWITCH.
Totally enclosed 3 pole changeover weight 3 grams. 19/-

STAMP FOR LEAFLET — OR CALL AT 4a AND SEE OUR RANGE.

REMCON SUPERHET RECEIVER
Specially designed for ease of assembly this receiver can be aligned with a pocket testmeter. It uses a 6 volt supply from the servo battery and is all-transistor for minimum consumption and maximum reliability. The printed circuit board is of maximum copper design and the coil is factory wound. The case is carefully made to give maximum protection. Size 2¼ x 1⅞ x 1¼ in. Weight 3½ oz.

THE RX YOU CAN BUILD FOR £8. 17. 6
(plus Bank and Crystal)

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SEMICONDUCTORS—micro alloy transistors and diode	45/-
SUPERHET CRYSTALS—matched pairs	57/6
RECOMMENDED REED BANKS:	
40 ohm. 12 CHANNEL ...	£9 19 6
40 ohm. 10 CHANNEL ...	£8 17 6
OUTPUT COMPONENTS Conversion to single channel	14/9
REMCON MERCO MARINE CONVERSION 49 & 61: Cooling Head, Flywheel, Muffler & Exhaust Pipe	£5.19.6
Cooling Head & Flywheel	£3.19.6

* We can now convert your Merco 29 or 35 for water cooling*

If you need our expert assistance with your REMCON TWELVE or REMCON SUPERHET, then we need your Tx without aerial or batteries or your Rx without plugs or connectors, adequately packed to prevent damage in transit.

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THE REMCON **PLEDGE** *We undertake to make operational, at reasonable cost, Remcon Twelve Transmitters and Remcon Superhet Receivers completed from our parts and in accordance with our instructions.*

USE TRANSIMATIC AMPLIFIERS

Follow your REMCON SUPERHET with TRANSIMATIC AMPLIFIERS in aeroplanes, boats, or any application where a motor requiring 600 mA at 2.4 volts is used in the servos. The amplifier makes relays unnecessary and ensures long life for your reed bank contacts. It is built on a printed circuit board which is shaped to fit snugly into a Duramite servo, but it can be mounted separately for use with other servos. The amplifier may be used for progressive or self-neutralising control.
The circuit has 4 NPN switching transistors and 2 PNP output transistors, miniature electrolytic condensers and sub-miniature resistors All components and hook-up wires are soldered to a single printed circuit board The battery required is a 6 volt pack tapped at 1.2 volts and 3.6 volts and this battery also powers the receiver. 57/6
We can supply p.c. board, first quality components, backing sheet, wire, screws, and pictorial instruction sheet.

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Reprinted from RADIO CONTROL MODELS & ELECTRONICS

I've got a Mini Power Boat in my tank!

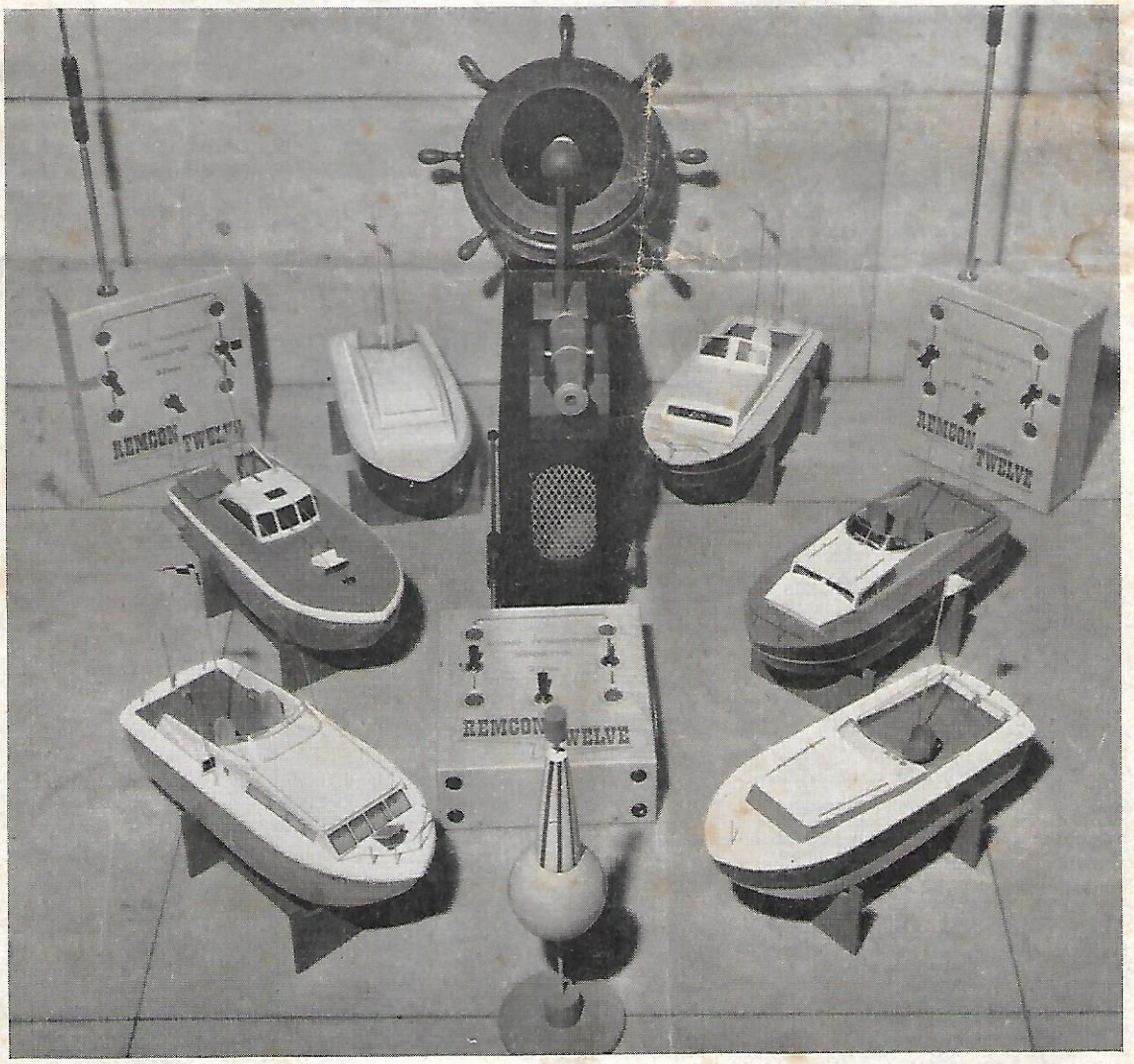
Geoff Chapman describes the Boat Show R/C models

AT the 1966 International Boat Show the Shell-Mex and B.P. Stand will, as last year, be devoted to Off-shore Mini Power Boat racing.

These boats are of interest to us since they are radio controlled, and produced as a joint project by Messrs. Partridge Models Limited and Remcon Electronics Limited.

The races are held in a closed circuit around a relief model of the Isle of Wight some 20 ft. × 12 ft. set in a tank 70 ft. × 30 ft. approximately 4 inches deep. The races are started by firing a cannon which also releases the arrester wire, holding the boats with motors running. The on/off switches on the boats are arranged so that their extended toggles serve as aerials, and on running into the arrester wire, switch off the motors and radio.

As can be seen from the accompanying layout these



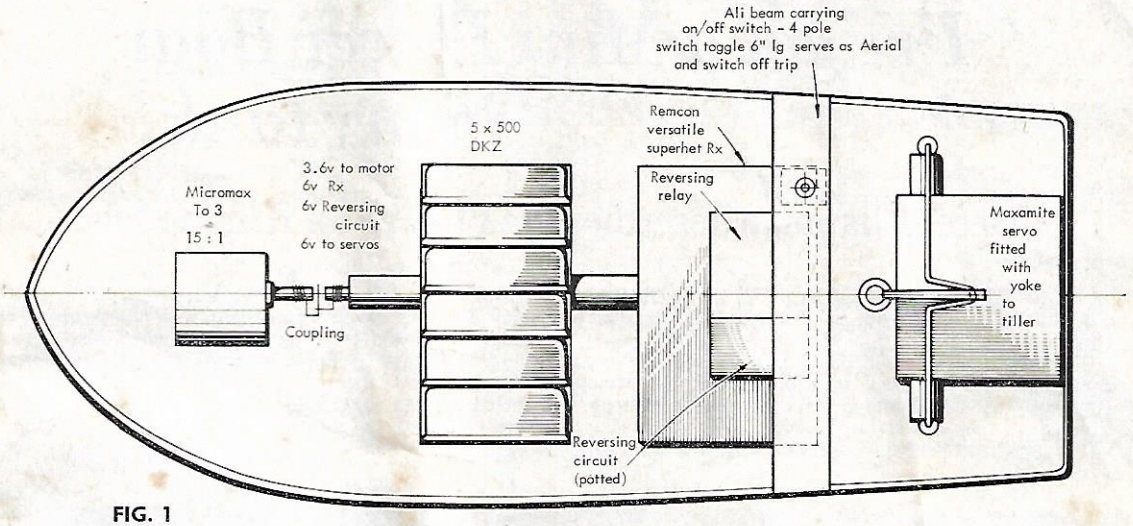
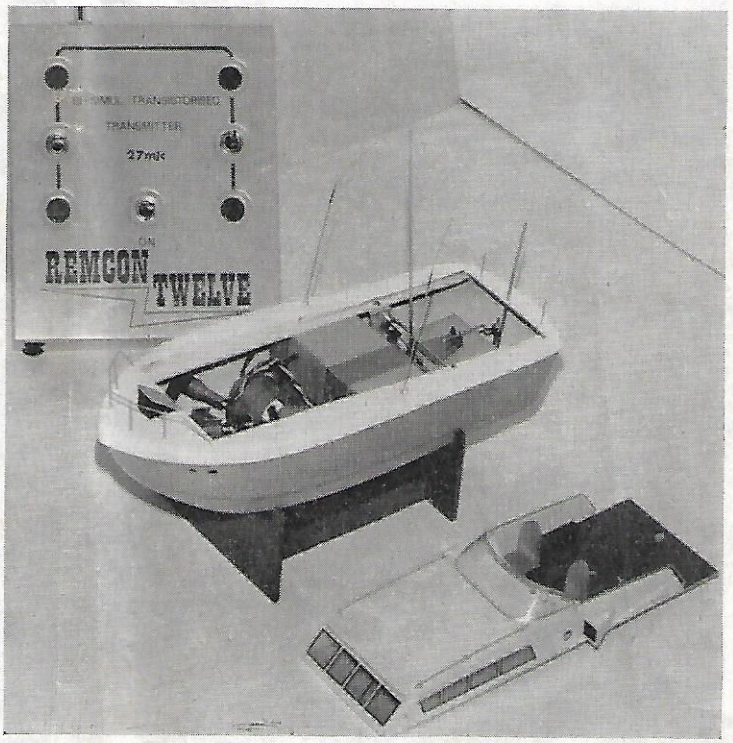


FIG. 1

boats are real miniature power houses which are able to run continuously for 5–6 hours between recharging.

The original design allowed for up to 12 boats each fitted with 6 channels to be operated simultaneously—this is arranged by using each of our six spot frequencies, and using the normal Remcon Tx in the simultaneous mode permanently. In actual fact only six boats are run at one time since it was felt that this is the number which can be properly managed, even so, only 3 Tx's are used to control the six boats, which speaks well of the simultaneous tone stability of the Remcon transmitter.

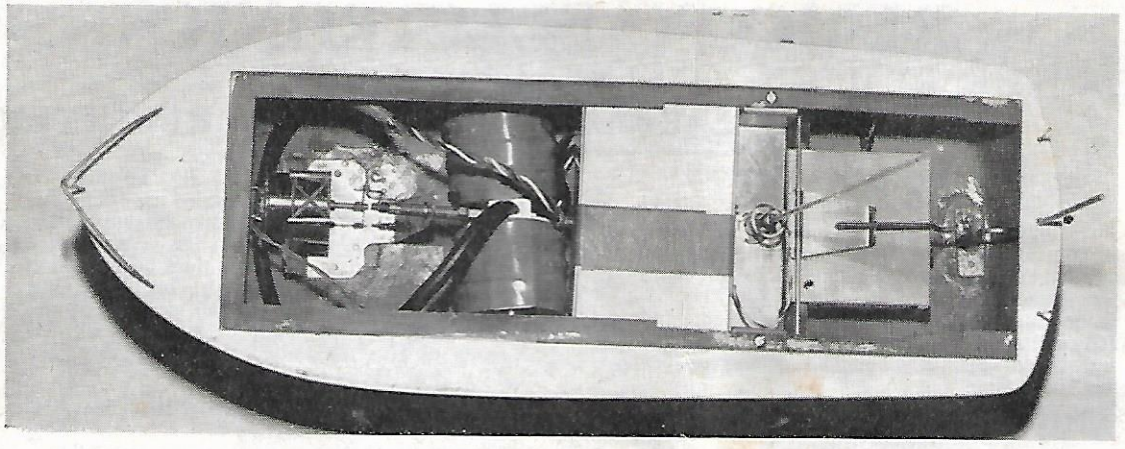
The main drive motors are Micromax T03, fitted with 15:1 gear boxes and are being operated on 3·6v. for top speed. (Fig. 1.) Under these conditions the motors have approximately 15 hours life, since they are being over-driven by some 50 per cent. The motors are capable of being reversed by a diminutive flip flop reversing circuit developed by Eric Hook. (Fig. 2.) This circuit may well prove useful to other boat modellers requiring reversing, providing the motor current does not exceed one amp. or so. The important feature is that the circuit consumes no current in one position, but on receiving



Left: the boats and transmitters arranged round the starting cannon and one of control wheels, the mechanism behind the latter being a biased off double throw switch to key the transmitter for steering. This "Daily Express" photograph was taken at a press demonstration held at the R.A.C. swimming pool.

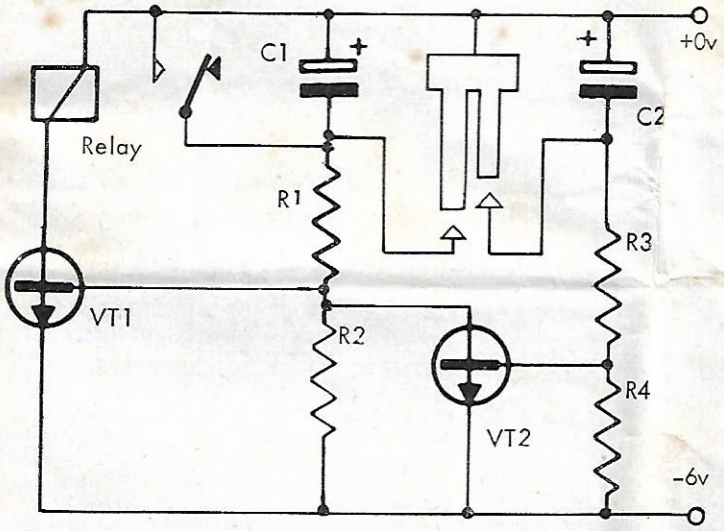
Fig. 1. above shows the layout of the latest Craft. Note how the rudder stock has been re-positioned forward of the Maximite to give greater rudder throw.

Photo right shows one of last year's Craft with its twin whip aerials and forward facing tiller.



Above: One of the earlier boats showing tiller linkage, motor mount and other items cement easily to the vacuum formed plastic hulls.

Fig. 2 shows a flip flop circuit, relay contact is additional to the change-over contacts for motor switching shown in Fig. 3.



Component Values

R1	:	1K
R2	:	2.2K
R3	:	1K
R4	:	2.2K
C1	:	10 μF
C2	:	10 μF
VT1	:	2N697
VT2	:	2N2926
Relay	:	PC4, 52Ω coil

FIG. 2

the merest "blip" from the "reverse" reed latches into the other position. Upon receipt of a "blip" on the "forward" reed the relay is released and the motor changes rotation. In this case forward is arranged to occur on the no current consumption position and vice versa. By using a double pole change over network the use of a centre tapped battery is avoided, and with it the risk of unequal discharging. (Fig. 3).

The Receivers are standard Remcon Versatile Superhets fitted with Deans 10 reed banks which have proved themselves most reliable in this application. The 6 receivers are aligned as 3 pairs to the 3 Tx's and the reed banks used so that there are 4 channels plus 1 spare reed position in each boat. Although the boats start off side by side under virtually swamp R.F. conditions there is no inter-action between them.

The servos are self-centring Maximites fitted with positive trigger Bonner type amplifiers which were chosen because of the current switched by the reed when driving these amplifiers is about one hundredth of that when driving a TASA amplifier. Examination of the reeds after the 1965 Boat Show showed there were no signs of electrical pitting, and this was after many tens of thousands of operations—probably equal to a normal modelling lifetime. As a point of interest it was calculated these boats each covered over 100 miles under their own power.

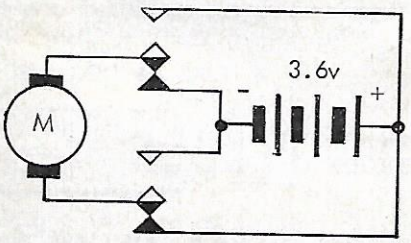


FIG. 3

The linear output of the servo is transferred to the tiller via a yoke necessitated by the cramped stern conditions, and the need to bring the rudder near to its stall angle to effect a tight turn.

Judging by the continuous queue of boys of all ages there were at the Stand last year, all eager to have a go, it was obviously a worthwhile advertising venture for Shell-Mex and B.P. as well as a really tough assignment for Remcon equipment.

We look forward to seeing the more advanced boats at Earls Court this year (January 5th to January 15th) and who knows, have a go and win a race.

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